

THE ROLE OF PAST EXPERIENCE IN
THE VISUAL APPREHENSION
OF MASKED FORMS

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THE ROLE OF PAST EXPERIENCE IN THE VISUAL APPREHENSION OF MASKED FORMS¹

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The present study² was suggested by K. Gottschaldt's investigation of the influence of experience upon the perception of figures.³ He employed as material a series of five simple geometrical figures for impression (the *a*-figures) and thirty-one complex figures for test (the *b*-figures) in each of which an *a*-figure was concealed as an inconspicuous part. They were drawn with black ink upon white cards and were exposed by projection on the screen. To a first group of observers, three in all, he presented, with the request to learn and to name, each *a*-figure three times, followed by the series of *b*-figures. Exposure time for the former set of figures was 1 second, and for the latter, 2. With no other instruction than to see and describe verbally the *b*-figures, the observers were kept ignorant of the fact that the *a*-figures were present in the *b*-figures. A second group of eight observers went through the same procedure with the only exception that the number of repetitions of the *a*-figures was increased to 520. Thus the amount of experience was supposed to vary with the number of times an *a*-figure was shown by itself, and the effectiveness of experience was measured by the number of times that figure was noted in a complex pattern containing it.

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² The writer wishes to express her warm thanks to Professor John F. Shepard for his constant encouragement and untiring criticism on both the experimental work and the preparation of this report. Her thanks are also due to Professor W. B. Pillsbury for his kind advice and for making available the greater number of the subjects.

³ Kurt Gottschaldt, *Über den Einfluss der Erfahrung auf die Wahrnehmung von Figuren. I. Über den Einfluss gehäufte Einprägung von Figuren auf ihre Sichtbarkeit in umfassenden Configurationen*, *Psychol. Forsch.*, 1926, 8, 261-317.



Gottschaldt found that in only 6.6 percent of the cases where the *a*-figures were learned with 3 repetitions, the *b*-figures were described in terms of having contained *a*-figures; whereas intensifying the impression by 520 repetitions of the *a*-figures yielded a result of 2.9 percent. These percentages included both cases in which the *a*-figures stood out immediately and cases in which the *b*-figures were seen and described as such and then the appearance of the *a*-figures occurred.

To find out how the addition of instruction to seek out the concealed *a*-figures would affect the results, Gottschaldt took the same two groups of observers and presented the *a*-figures twice more to the group who had seen them 3 times and 20 times more to the group with 520 original repetitions. The observers were given instruction to look for the five learned figures in the complex patterns. The results showed that the percentages of successful finding of the *a*-figures in the two experimental groups were 21.5 and 19.4 respectively.

Gottschaldt came to the conclusion that the number of times a simple figure was shown (3 or 520, 5 or 540) made no difference in the likelihood of its being seen in a complex one; that is, the effect of experience was slight in the face of the strong 'belonging together' of natural wholes. However, a considerable increase of positive cases was obtained by giving instructions to the observers to look for the simple figures. Even so, the degree of coherence in the larger figure was still a decidedly limiting factor, he said. It was concluded then that the effect of accumulated repetition of a part upon the perception of a greater complex was very small and that the influence of the inner test situation of the observer was of greater significance. This latter statement Gottschaldt greatly elaborated in a separate series of experiments.⁴

He used easy figures to study how a slight variation in the procedure affected perception. After an *a*-figure was exposed successively, for size-comparisons, 40 times, a *b*-figure was

⁴ Kurt Gottschaldt, Über den Einfluss der Erfahrung auf die Wahrnehmung von Figuren. II. Vergleichende Untersuchungen über die Wirkung figuraler Einprägung und den Einfluss spezifischer Geschehensverläufe auf die Auffassung optischer Komplexe, *Psychol. Forsch.*, 1929, 12, 1-87.

inserted between two *a*-figures to be compared as a disturbance picture, and the observers were instructed to describe the *b*-figure. It was found that if this instruction was made at the beginning of the experiment before the learning began, the *b*-figure was seen as the *a*-figure plus a line; but if the instruction came immediately after the learning series and before the triple exposure, the *b*-figure was seen as a whole with no relation to the *a*-figure.

Another group of experiments dealt with the question whether the appearance of *b*-figures from the threshold was influenced by previous learning of the *a*-figures. The results showed that the sequence of the phases of the appearing depended upon the course of experimental procedure; if the situation-vector directed the perception toward the *a*-figure, the *b*-figure came into being by starting with the *a*-figure. When the test-figure was inserted between the two comparison figures without any interpolated instruction, the *a*-figures were seen in the *b*-figures; but when the observer was informed at the end of the learning series and before the test that new figures were about to appear, the *a*-figures were not seen. Furthermore, in alternating two *a*-figures in learning, if *b*-exposures entered and fitted in the order of the series, the *a*-figure was perceived in the *b*-figure, but if they did not fit in, e.g., if the entering of a *b*-figure was not directed toward its own *a*-figure, no trace of an after-effect of experience was found.

In a third group of experiments, the effect of the interval between learning and test was studied. It was found that in only 1.2 percent of the cases studied for the immediate effect of previous experience the comprehension of the *b*-figure was determined by the *a*-figure. However, if the situation of the *b*-exposure contained a vector directed toward the *a*-figure, as, for instance, when an *a*-figure was being described the exposure of the *b*-figure came to interrupt, the *a*-figure was seen in the *b*-figure. The same results were obtained when the *b*-figures in the test followed the rhythm used for the *a*-figures.

Therefore according to Gottschaldt, situation-vectors are the essential factors in perception. In his own words, "We

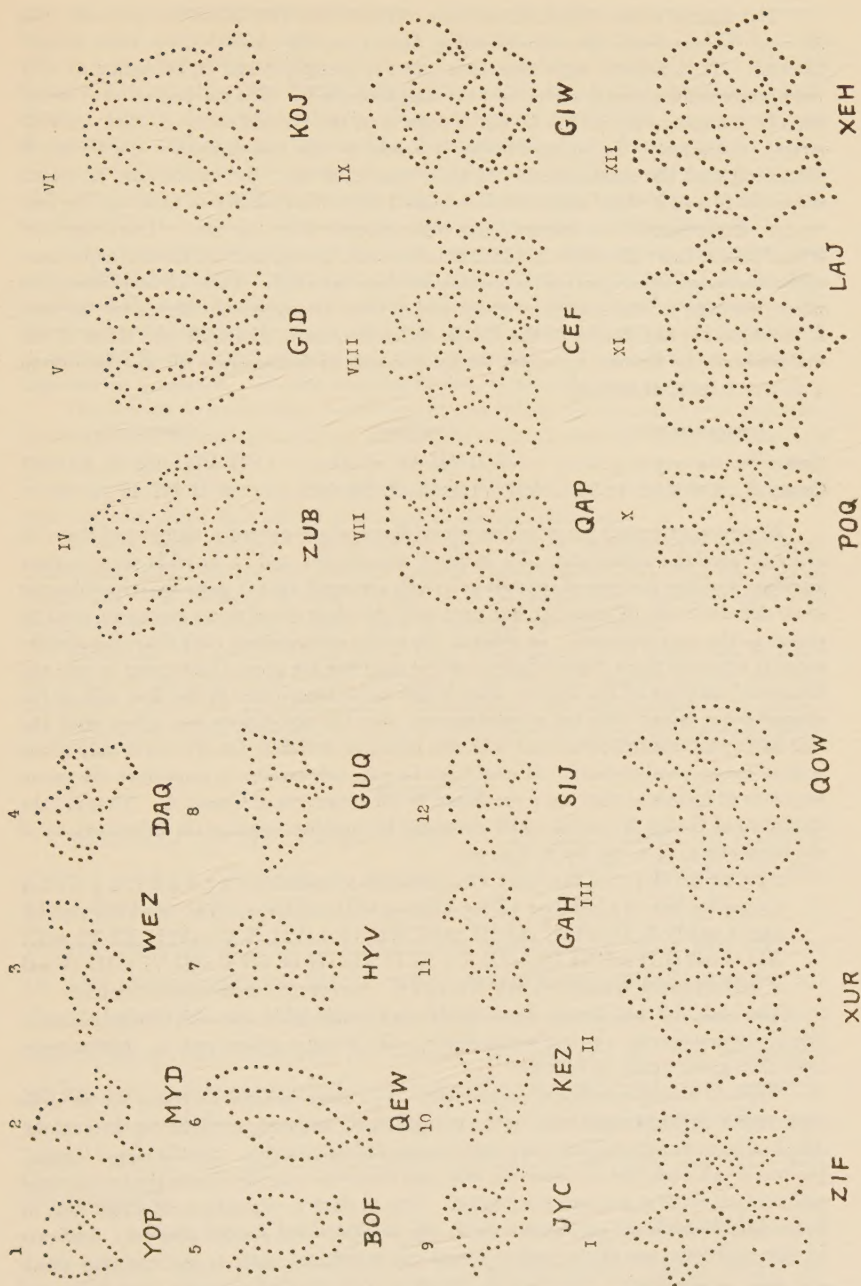
are justified to assume that all results of perception of *a*-figures in *b*-figures are to be traced back to the effect of the situation-vectors."

With many of Gottschaldt's figures, it is nearly or quite impossible to organize the complex figures so that the simple figures will appear as units of the complex figures. Clearly there are factors which sharply delimit the possibilities of organization, and numerous repetitions are practically without result in changing this limitation. We need not at this time consider what these limiting factors are. However, suppose we should design simple and complex figures such that, in addition to organization in which all or a characteristic part of the simple figure functions as a unit of the complex figure, many other organizations of the complex figure are more or less equally probable; suppose, furthermore, that the technique gave no situation-vector or set which might tend to isolate the simple in the complex; what then would be the effect of past experience? That was our problem.

A number of preliminary experiments were carried out which we need not describe in detail, since they only led to the technique used in the main investigation. They suggested that dotted figures lend themselves to more varied organization than those drawn in solid line. It proved impractical to use familiar objects, forms, etc. as the embedded figures, since one cannot then obtain a satisfactory control group of observers. It was shown that parts of the simple figures no more than the whole must occur as definitely isolated units in the complex figures, since it then becomes only a direct recall to pass from the definitely isolated part to the whole simple figure. In view of these findings, the following technique was designed to solve the problem as stated above.

MATERIAL AND PROCEDURE

The material employed in this experiment consisted of a series of 12 irregular figures composed of dotted lines. This might be called the simple-series. Another series of 12 figures of a more complex nature, each masking a figure of the simple-series, formed the masked-series. All these were lithographed on white paper, each mounted on a cardboard 5 × 3 in. Below each figure was a nonsense syllable, as shown in the accompanying page. On account of the nature of the procedure, to be described in the following paragraphs, many copies of the figures were provided. The figures are shown in the charts.



The figures in the simple-series were divided into two halves of six each—the A- and B-series—and the corresponding figures in the masked-series were treated likewise. The observers were separated into two groups, A and B, according as they were presented the simple-series A or the simple-series B. The masked-series A would then be the test-series for the Group A observers; the masked-series B, their control-series. Conversely, the masked-series B would be the test-series for the Group B observers; and the masked-series A, their control-series. By ‘test-series’ is meant the series in which those observers were tested as to their ability to pick out the particular simple-figure, now masked, as a unit separate from the rest. ‘Control-series’ is used here to mean the series in which the observers, having had no previous experience of the concealed figures, served as controls for those who did. Thus, all masked-figures were presented to both groups of observers, but the arrangement differed for the two. If we represent the figures of the simple-series by Arabic numerals and those of the masked-series by Roman numerals, we shall be able to demonstrate the distribution in a clearer fashion, as follows:

	<i>Impression-series</i>	<i>Test-series</i>	<i>Control-series</i>
Group A	1 2 3 4 5 6	I II III IV V VI	VII VIII IX X XI XII
Group B	7 8 9 10 11 12	VII VIII IX X XI XII	I II III IV V VI

However, in actual presentation every figure was repeated a number of times in order to give the appearance of a memory experiment and to provide more perfect learning, and the manner of repetition was so arranged that it gave the experimenter some definite order of sequence but provided the observer with no cue as to what to expect in the next exposure. In general, the entire arrangement runs thus: the simple-series is repeated three times; their nonsense syllables are given three times to test the observers’ memory of the figures; then follow three repetitions of the first half of the control-series mixed with the simple-figures; then the test-figures are mixed with the last half of the control-series and with the nonsense syllables for the previously given control-figures; and so forth. It might not be too cumbersome to reproduce the entire sequence of figures as they were presented to the observers of Group A. That for the observers of Group B can be easily surmised by making appropriate substitutions of the numerals 1, 2, 3, etc. by 7, 8, 9, etc.

2 5 3 1 6 4 VII 3 5 2 4 6 1; 2 5 3 1 6 4 nonsense syllables for 3 5 2 4 6 1, 2 5 3 1 6 4
3 5 2 4 6 1 VII; 6 4 VIII 3 1 IX 2 5 VII ns3 VIII ns6 IX ns1 VII ns5 VIII ns2 IX
ns4; 1 nsVII X II nsVIII XI III nsIX XII IV nsVII X V nsVIII XI VI nsIX
XII; 1 nsVII II nsVIII III nsIX X I XI II XII III IV nsI V nsII VI nsIII IV nsI
V nsII VI nsIII X nsIV XI nsV XII nsVI. (ns stands for nonsense syllable.)

The observer was seated comfortably at a small table, on which were placed a pile of stimulus cards, a pad of white paper, a black and a yellow pencil. Instructions were then given orally as follows:

“This is a simple memory experiment. You have in front of you a set of cards each with a figure of some kind in the middle and a nonsense syllable at the bottom. All the figures are dotted but they vary in size and complexity. At the signal ‘begin,’ the top blank card will be removed, and you are to look at the figure thus uncovered and study it until it is covered up again. Try at once to reproduce, in either dots or continuous lines, what you have seen on the pad provided for the purpose. Indicate by the additional use of the yellow pencil the individual units or sections into which you split up the figure. Cover up the result of your attempt as soon as you finish and write an introspection of it; that is, a descriptive account of the figure as it appeared to

you and of the mental processes involved. When this is done, you are ready to have another trial of the same figure, and you reproduce and introspect as before; so on till you have the figure complete and correct. At a later time you will relearn the same figure. You are allowed as many trials as you need at each learning or relearning of a figure. Then a new figure follows. Proceed with it as you did the previous one. In connection with each, try to memorize the name in the form of the nonsense syllable. After several repetitions or presentations of a figure, you will be tested as to how much of it you can reproduce from memory when you are shown a nonsense syllable alone. In that case, copy the nonsense syllable and supply the figure belonging to it."

The very first stimulus-figure was a sample one constructed along the same principles as the more complex figures but containing no simple-figures. At the completion of this one, questions were asked and answered between the experimenter and the observer concerning the exact procedure, to make sure that every point was clearly understood by the latter. Then the experiment began. The simple figures were each exposed for 5 seconds. For the complex figures, 15 seconds were given.

In addition to instructions concerning the procedure, the observers were requested to refrain from discussing the nature and content of the experiment with other observers or with friends. So far as schedules allowed, two or three, and occasionally four, observers worked in the room at the same time. The individual tables were so placed that stimulus cards were within easy reach of the experimenter.

It took each observer approximately ten hours to complete the experiment. Those were distributed in five two-hour periods within one week, as far as his schedule permitted. The amount of work covered by each experimental period is shown for Group A above where each period's work is bounded by semi-colons.

Altogether 138 observers took part in these experiments, 29 of whom were students secured from the University bureau in charge of the F.E.R.A. project and the rest were members of the class in Introductory Physiological and Experimental Psychology. All of them were naïve observers, so far as the purpose of this experiment was concerned.

RESULTS

Learning of the Simple-series as Establishment of Experience.—Before making a survey of the main results of the experiment with respect to the rôle of past experience, it would be instructive to obtain an account of how the figures of the simple-series itself were described and learned, for the sake of a better understanding and analysis of the results concerning the manner in which the figures of the masked-series were apprehended. To study the rôle of past experience in perceiving masked figures, it is imperative that we know what the past experience consisted of and how it was established.

As it has been explained in the section on Material and Procedure, the simple-figures, the apparently more complex figures and their nonsense-syllable names appeared to the

observers to be all mixed in order. For them the task was alike throughout, that of reproducing and of describing, whether the stimulus figure be simple or complex, present or replaced by a nonsense syllable.

Except in a relatively few cases (approximately 6 percent) where a simple-figure was reproduced correctly at the first trial, all required more than one trial for a first complete reproduction. The number of trials ranged from 1 to as many as 14. The following table will reveal both the range of the number of trials and the average for each simple figure.

As should be expected, the second presentation of a figure required fewer trials for correct reproduction than the first. Only in less than 3 percent of the cases did the number of trials exceed that in the first presentation of the figure, and in more than half of the cases one trial sufficed. When a figure

TABLE I
RANGE AND AVERAGE OF THE NUMBER OF TRIALS TAKEN BY THE OBSERVERS TO LEARN
THE SIMPLE-FIGURES

Figures	MYD	BOF	WEZ	YOP	QEW	DAQ	JYC	GUQ	SIJ	KEZ	HYV	GAH
Range..	1-9	1-7	1-6	1-9	1-4	1-13	2-14	2-8	2-8	1-6	2-9	1-14
Average	3.75	3.17	2.5	3.45	1.84	3.62	4.63	4.55	3.84	2.6	4.5	3.77

appeared a third time, one trial was the rule, although $1\frac{1}{2}$ percent of the cases required more than one trial.

A study of how each of these twelve figures was learned showed a predominance of either a one-unit or two-unit organization depending upon the individual figure. Figure 1 was unique in that it was learned in the greatest variety of ways, so varied that it defied a clear-cut classification. It suffices to say that half of the observers learning it looked at it as consisting of two parts; less than one-third of them, as of three parts. Figure 2 was seen mostly as made up of two units, with either unit equally dominating in frequency. One-third of the observers saw it as one whole. With Figs. 3, 4, 5, and 6, the majority of the observers in each case learned in two units; the rest of them, as either one entire figure or more than two parts.

The tendency in learning Figs. 8, 9, 10, 11, and 12 was to trace the outline contour as a whole before supplying what existed inside it. Although there was found a minority of cases of observers learning the figures as two separate units or more, yet the number was not at all comparable with that of the general trend. Figure 7, like Fig. 1, was a case by itself, there being no such thing as dominating tendency. However, it was learned mostly by getting hold of a larger unit and completing the figure by adding subsequently the parts attached to it.

The outstanding feature of the introspections concerning the simple-figures is the variety of descriptions. These may be divided roughly into four classes. Some observers did not attempt to describe at all; when asked for introspections, they replied that they had nothing to say, for the figures were merely a mess of lines and curves. Another group would write about them of their own initiative, some of their expressions being as follows: "It looks like nothing on earth," "It doesn't mean a thing to me," "It has no particular significance to me," "I don't recall ever having seen anything like it before," "It looks crazy," "It meant nothing definite to me," and the like. A third group would simply tell something of their method of attack and order of procedure. These three may be considered as one class when compared to a fourth group in so far as the latter described the figures in terms of their resemblance to familiar objects, alphabetical letters and geometrical designs.

These descriptions with reference to familiar objects and designs show a wide range of variation. In what follows only those are selected in which two or more observers agree in that particular type of description, the others being discarded. Each simple-figure is represented by its nonsense syllable name, followed by the list of descriptions arranged in the order from greatest to least frequency of occurrence.

MYD—triangle, bird, leaf, flower petal, pyramid

BOF —heart, shield, leg and foot, tulip, M, V, bag

WEZ —diamond, pipe, shoe, lamp, triangle, face and hat,
shield

- YOP —semi-circle, rectangle, heart, V, triangles, Y, top, bud
 QEW —moon, hat, crescent, banana, cup and saucer, slice,
 boat, semi-circle
 DAQ —basket with contents, flower pot, bowl, chemical
 apparatus
 JYC —chick or duck's head or beak, heart, triangle, Y, B,
 flower, egg cracked
 GUQ —shield, bat, wooden shoe, star, crown
 SIJ —helmet, football, mushroom, egg, image or form on
 base
 KEZ —star, triangle, arrowhead, cat's ears, M
 HYV —B, D, other alphabetical letters
 GAH —waves, boat on water, wooden shoe

It can be readily seen that these comparisons pertain sometimes to one small portion of the figure and sometimes to more than one part, although in the majority of cases the descriptions are ascribed to the whole figure under consideration. In no case did an observer indicate exact similarity. The most common expressions used in this connection are: "It reminded me of," "looked something like," "seemed to suggest," "appeared like," "got impression of," "got general idea of," and so forth.

However, putting the introspections of all the observers together, one finds that these simple-figures were quite unfamiliar to them and did not obtain one common response from them.

The Influence of Past Experience upon Subsequent Experience.—Sixty-one observers were employed in the first part of the experiment, thirty in Group A and thirty-one in Group B. Group A was given Figs. 1-6 as simple-figures and consequently Figs. I-VI as test-figures and Figs. VII-XII as control-figures. Group B had Figs. 7-12, VII-XII and I-VI for the respective purposes. Results for Groups A and B are shown in the first part of Table II.⁵ In this Table, 'T' stands for test, and 'C' for control. T₁ under ZIF means that the Fig. ZIF is the first test figure in the series, T₂ the

⁵ Results for individual observers not reproduced here may be obtained from the University of Michigan Library at request.

TABLE II
'SUCCESSSES' AND 'FAILURES' MADE BY DIFFERENT GROUPS

Group		ZIF	XUR	QOW	ZUB	GID	KOJ	QAP	CEF	GIW	POQ	LAJ	XEH
A	Class	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆
	Successes	6	14	23	12	18	28	0	0	0	5	0	0
	Failures	24	16	7	18	12	2	30	30	30	25	30	30
B	Class	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆
	Successes	0	0	3	0	0	3	9	9	5	21	5	22
	Failures	31	31	28	31	31	28	22	22	26	10	26	9
A ₁	Class	T ₅	T ₂	T ₄	T ₁	T ₃	T ₆	C ₅	C ₂	C ₃	C ₄	C ₁	C ₆
	Successes	2	6	15	1	7	13	0	0	0	1	1	0
	Failures	15	11	2	16	10	4	17	17	17	16	16	17
B ₁	Class	C ₅	C ₂	C ₄	C ₁	C ₃	C ₆	T ₅	T ₂	T ₃	T ₄	T ₁	T ₆
	Successes	1	0	1	0	0	0	6	2	3	15	1	14
	Failures	18	19	18	19	19	19	13	17	16	4	18	5
C	Class	T ₁	C ₄	T ₆	C ₃	T ₄	C ₆	T ₃	C ₂	T ₂	C ₅	C ₁	T ₅
	Successes	5	0	18	0	14	2	9	0	6	2	0	17
	Failures	15	20	2	20	6	18	11	20	14	18	20	3
D	Class	C ₁	T ₄	C ₆	T ₃	C ₄	T ₆	C ₃	T ₂	C ₂	T ₅	T ₁	C ₅
	Successes	0	13	1	10	0	21	0	9	0	19	3	1
	Failures	21	8	20	11	21	0	21	12	21	2	18	20
A + A ₁	Class	T	T	T	T	T	T	C	C	C	C	C	C
	Successes	8	20	38	13	25	41	0	0	0	6	1	0
	Failures	39	27	9	34	22	6	47	47	47	41	46	47
B + B ₁	Class	C	C	C	C	C	C	T	T	T	T	T	T
	Successes	1	0	4	0	0	3	15	11	8	36	6	36
	Failures	49	50	46	50	50	47	35	39	42	14	44	14

second test figure in the series, and so on. The number of 'successes' under each item represents the number of cases in which the masked simple-figure is apprehended as a unit. The number of 'failures' represents the number of cases in which such apprehension fails to take place.

A glance at the results of the first two groups in the Table would reveal the enormous discrepancy between the results from the test-figures and those from the control-figures. The former were often apprehended in such a way that the simple-figure learned before now forms a unit by itself distinct from the other parts of the total complex pattern, whereas the latter figures were seldom apprehended in such a manner. Thus, ZIF was divided into sections with YOP as a unit by six observers in Group A who received it as a test-figure, but by none in Group B who had it as a control-figure. In the

same way the small unit HYV included in QAP was grouped as a unit by nine observers in Group B who had had HYV in their previous experience but by none in Group A. The few cases where the control-figures were divided with the included simple-figures as individual units occurred with POQ by Group A and QOW and KOJ by Group B. If past experience did not operate, either the amount of positive results in the test-figures ought to be small and approach that in the control-figures, or the number of control-figures apprehended in similar ways as the test-figures ought to increase to a comparable amount. Neither of these was what actually took place.

Similar procedure was used with another group of observers. Changes were introduced in the arrangement of the order of presenting the test-figures. The positions of ZIF and ZUB were exchanged for Group A and those of QAP and LAJ were exchanged for Group B. These observers may be called Group A₁ and Group B₁ respectively. The purpose for the shift was to find if a simple-figure contained in a test-figure occurring at the beginning of the series and detected with difficulty would be more easily detected when placed in the middle of the series and immediately after one whose masked-figure was easily found out; and to see if a test-figure occurring in the middle of the series would become more 'difficult' when placed at the beginning of the series. Thirty-six observers took part in this, seventeen in A₁ and nineteen in B₁. The results are shown in Table II following those for Groups A and B.

Here again the results for each figure are different depending upon whether it is a test-figure or a control-figure. If the small figure contained in it had been learned as a simple-figure, the larger figure is likely to be organized in such a fashion that the small figure forms an independent part. With the control-figures, however, only a small percentage of that kind of organization is recorded. The results on the exchange of positions of test-figures are going to be reported in a later section.

Forty-one observers were employed in a third part of the

experiment, in which the same figures were used but the distribution and arrangement of the figures were changed. On the basis of the results of the previous parts of the experiment, the twelve complex figures were arranged in order from the greatest to the least difficulty, so far as the degree of ease of solving the test-figures in terms of the simple figures was concerned, and then divided into two equal sets on the same basis. Therefore two changes were introduced: (1) the two divisions of six figures each were more comparable in their 'degree of coherence' and (2) the arrangement of each section was strictly in the order of decreasing 'difficulty.' They may be called C and D series. The C series of figures consisted of ZIF, GIW, QAP, GID, XEH, and QOW; the D series, LAJ, CEF, ZUB, XUR, POQ, and KOJ. Consequently, the simple-figures for learning for the C group of observers were YOP, JYC, HYV, BOF, SIJ, and WEZ; for the D group of observers, GAH, GUQ, DAQ, MYD, KEZ, and QEW.

Twenty observers of the C group had the C figures as test-figures and the D figures as control-figures; twenty-one observers, the D figures as test-figures and the C figures as control-figures. The results are given in the lower middle section of Table II.

Again there is a great difference in the results of the experimental and the control divisions. Only 6 cases out of the total 246 of the controls showed a grouping as units like the simple-figures of which they had had no experience, whereas 144 cases out of the experimentals segregated the figures learned before.

At the bottom of Table II are found the results for Groups A + A₁ and B + B₁. The results for all the three experiments are summed up in Table III.

Compared to the number of 'successes' of the division with experience, the amount of 'success' of the non-experience division is negligible. For the former, the amount of success is 48.5 percent; for the latter, 2.5 percent. These comparisons lead one to the position that past experience of certain forms is not without influence in the apprehension of other visual patterns.

TABLE III
TOTAL NUMBER OF 'SUCCESSSES' MADE BY ALL THE OBSERVERS

	ZIF	XUR	QOW	ZUB	GID	KOJ	QAP	CEF	GIW	POQ	LAJ	XEH
Test	13	33	56	23	39	62	24	20	14	55	9	53
No. of Os...	67	68	67	68	67	68	70	71	70	71	71	70
Percent of Os.....	19	49	84	34	58	91	34	28	20	77	13	76
Control....	1	0	5	0	0	5	0	0	0	8	1	1
No. of Os...	71	70	71	70	71	70	68	67	68	67	67	68

The series of complex figures were learned in various ways according to the construction of each individual figure. Figs. I, X, and XII were learned largely by starting with the top or left portion, going to the lower right, and finishing by correcting the connections in the middle. Figs. II and IX, however, were usually learned either by proceeding from the bottom around the left to the right or by making an outline contour and filling in the center section. On Figs. III, IV and V, the observers began with the top working to the bottom. Figs. VI and VII were learned in the left-right direction. There was not any one dominant tendency in Figs. VIII and XI unless it was from the boundary to the internal parts.

In all these figures, the strong tendency next to the dominant one dealt with in the last paragraph was to proceed from the general outline of the figures to the details within. A second thing to note is that in those figures whose hidden simple-figures were detected at the outset, the method of learning was to use that as a basis and to build the rest around it.

One third of the observers showed a tendency to persist in using the same method in most of the complex figures: 26 of them inclined to learn most of the figures by getting the outline contour and then completing the internal parts; 7 by starting with the left-hand portion; 6 by proceeding down from the top; and 6 by crowding everything into the picture from the beginning.

In connection with the discovery of simple-figures, introspections were recorded by the observers to the effect that a former or familiar figure had been recognized. Some of the more common expressions were: "Figure so and so is in the center," "I noticed the pattern drawn before." "I noted a similarity between the encircled unit to one of the simpler figures," "It contains a simple design learned before," and so forth. Not infrequently were the nonsense syllable names of the simple figures given, mostly correctly, for if the name did not appear immediately, the observer could always resort to such vague expressions as previous figures or former designs. Such introspections were, of course, absent from the observers working on the control figures.

As to how many of the 'successful' cases were accompanied by the statement in the introspections that a simple-figure was recognized, we have Table IV giving the number of ob-

TABLE IV
NUMBER OF OBSERVERS REPORTING RECOGNITION OF SIMPLE-FIGURES

Groups According to the Number of Successes	Number of Observers Reporting Recognition of Simple-figure in						
	0 Test Fig.	1 Test Fig.	2 Test Fig.	3 Test Fig.	4 Test Fig.	5 Test Fig.	6 Test Fig.
Os. making 6 succ.....					I		6
Os. making 5 succ.....		3	2	2	2	II	
Os. making 4 succ.....	3	4	I	6	9		
Os. making 3 succ.....	IO	I	4	12			
Os. making 2 succ.....	8	8	19				
Os. making I succ.....	8	8					
Os. making 0 succ.....	IO						
Total.....	39	24	26	20	12	11	6

servers in each of the seven groups making mention of the fact in the given numbers of cases. The Table reads thus: one observer in the group making 6 'successes' mentions having found a simple-figure learned before in 4 out of 6 of the test-figures, 6 observers so state in all 6 of the test-figures; 3 observers in the group making 5 'successes' mentioned the fact in one case each, 2 observers each in 2, 3 and 4 cases, and 11 of them in 5 test-figures; and so forth.

Altogether 275 'successes' in a total of 401 were mentioned in the introspections, making 68 percent.

Variability in the Effectiveness of Past Experience.—Throughout the different parts of Table II, we notice a difference in the degree of 'success' among the various test-figures, as measured by the relative amount which persists in the various experiments. In Groups A and B the different numerical figures as the sum of positive cases for the test-figures reveal a difference in the ease with which the simple-figures were recognized. The increasing order of ease in Group A runs from ZIF with its six positive cases, through ZUB, XUR, GID, QOW, to KOJ, which has twenty-eight positive cases out of thirty. The test-figures for Group B are ranked from LAJ and GIW with five successes each, through QAP, CEF, POQ, to XEH with its twenty-two successes. This variation in the rôle of past experience exists doubtlessly as a result of the relative ease of dissolving the different test-figures into the simple-figures and the parts making up the camouflage.

In Groups A_1 and B_1 , the likelihood of a masked figure being grasped is again shown to be dependent upon the degree of coherence of that test-figure. That may be graded by the number of 'successes' for each. The order for Group A_1 is ZUB, ZIF, XUR, GID, KOJ and QOW; that for Group B_1 , LAJ, CEF, GIW, QAP, XEH, and POQ. Here in Group A_1 as before in Group A, ZUB and ZIF give the least results. However, the result in this particular group is proportionally much less all through the different figures, except QOW, than that in Group A. Turning to Group B_1 , we find as compared to Group B also a general proportional reduction of success throughout, except in POQ and XEH where an increase is shown. This may be conjectured to be due to an inferiority on the part of these observers or to chance with the smaller size of the groups.

This increasing order of success in the test-figures exists also with Groups C and D in agreement with the results of the previous experiments. In fact, the order as achieved by Groups C and D is practically the same as that by Groups

A + A₁ and B + B₁. On the whole, LAJ, ZIF and GIW stand first in difficulty; CEF, ZUB and QAP come next; XUR and GID are medium; and XEH, QOW, POQ and KOJ seem the easiest. These all tend to show that the degree of coherence is not without its potency in determining the effectiveness of past experience.

Effectiveness of Past Experience and Attitude of Search.—A question might be raised concerning the factor of a search-attitude contributing to the successful detection of the masked figures in others succeeding any figure thus analyzed. It is asked, for instance, whether after the first successful finding of the masked figure, the observer might not become enough aware of the general situation to have his naive attitude completely changed into one of hunting for the simple-figures. The answer is that they very well might adopt such an attitude of seeking out the small figure. Although we cannot get down to the actual amount involved, on account of danger of giving suggestion by questioning, we have some evidence that search does exert its influence upon the finding of the simple-figures.

Evidence may be found in the introspections. On the test-figures, only three observers, namely, 37, 39 and 125, recorded an effort at search. Since the last three control-figures do not occur until one or more test-figures have been presented, any act of looking for the masked-figures may be shown in these last control-figures and recorded in the introspections. Thus we find ten observers say that they tried to see familiar units in those figures but could not recognize any of the simpler figures.

However, this does not alter our general position bearing on the influence of past experience. Considering only the first 'success' for each observer and leaving out all the succeeding ones, we still find that there are in the experimental groups a disproportionately greater number of 'successes' than in the control groups. Table V shows such results. The few 'successes' of the control figures are given in parentheses.

Thus, eliminating any results from circumstances which

TABLE V

NUMBER OF OBSERVERS MAKING 'SUCCESSSES' WHICH ARE NOT PRECEDED BY
OTHER 'SUCCESSSES'

Groups	ZIF	XUR	QOW	ZUB	GID	KOJ	QAP	CEF	GIW	POQ	LAJ	XEH
A	6	9	11	0	2	2				(5)		
B			(3)			(3)	9	6	1	7	0	3
A ₁	0	6	5	1	3	2				(1)	(1)	
B ₁	(1)		(1)				0	2	3	9	1	0
C	5		1		3	(2)	3		3	(2)		4
D		3	(1)	2		0		7		6	3	(1)
Total Test	11	18	17	3	8	4	12	15	7	22	4	7

might present a mixture of the influence of previous experience and of a search-attitude and considering only the one first success by each observer, we yet obtain a result showing by a wide margin the effect of past experience.

The influence of search can possibly be tested also in the 'success' of the observers toward the second presentation (or relearning) of test-figures whose small figure had been overlooked at the first presentation (or first learning). For, aside from ten observers who were absolute 'failures,' all had one or more 'successes' in the first presentation of the test-series. That may lead them, when a figure on which they had failed comes around again, to assume a different attitude and to be more likely to seek out the hidden simple-figure.

The facts are as follows. Of 10 observers who had no 'success' on first presentation, one gave 1 success later. Of 16 observers making 1 success each on first presentation, 3 added a total of 4 on later presentation. Of 35 making 2 each on first, 13 added a total of 26 later. Of 27 making 3 each on first, 13 added a total of 21 later. Of 23 making 4 each on first, 11 added a total of 17 later. Of 20 making 5 each on first, 3 added 1 each later. For only a small part of the observers were the additions sufficiently large to indicate positive effects of an attitude of search. Most of the additions might have occurred as a result of study in relearning.

It may be noted that, if we add the 72 'successes' on later

presentations to the 401 which occurred on the first presentation, we have a total of 57 percent successes on test-figures.

In changing the order of presenting the test-figures for the observers in Groups A_1 and B_1 from that in A and B, it was expected to find a variation in the results of the figures involved in the change. To be sure, a figure like ZUB occupying a middle position in the series A underwent a decrease in its amount of success when moved to the head of the series in A_1 , but the figure ZIF exchanging position with it also underwent a reduction in success. Any clear analysis here is obscured by the fact that this group of observers happened to be of a poorer caliber, as shown in the general low level of success through all the figures. A comparison of items in B and B_1 shows that the exchange of position between LAJ and QAP has brought about a marked decrease in the success of LAJ when it assumes a first position preceded by none but the control figures, and a proportionally slight increase in the success of QAP which now occurs in the middle of the series following POQ, one of the very easy figures.

Not a few observers remarked that the presence of the known figure made easier the mastery of the larger figure, serving as a basis upon which the rest was built, although the fact is sometimes mentioned that the familiar figure made it hard for the rest to be placed in correct relation with it.

As to the general attitude, favorable or otherwise, of the individual observers toward the task, observations were made and recorded by the experimenter. These, combined with the introspections, gave three classes of attitude, namely, interest, abhorrence and indifference. The majority of them have the indifference attitude, showing no particular enthusiasm for, nor any hostility toward, the type of work. Next in number comes the group who demonstrate a decided interest in it. Then there are those who abhor it because, they aver, it is uninteresting or too difficult.

From this classification is discovered an interesting fact that success in finding the simple-figures in the camouflage seems to bear a relation to the amount of interest displayed. Observers who worked with enthusiasm made, on the average,

the largest, and those with dislike, the least number of successes. Those who were indifferent stood in between.

The Effect of Past Experience Upon the Speed of Learning.—The complex patterns under which the simple-figures are masked differ in the ease with which they are learned. The number of trials for a first successful reproduction of the figures range from 1 to 22. The average number of trials for each figure, separate as test- and control-figure, is shown in Table VI, which reveals several important facts. First,

TABLE VI
AVERAGE NUMBER OF TRIALS FOR LEARNING THE COMPLEX FIGURES

	ZIF	XUR	QOW	ZUB	GID	KOJ
Test						
Positive cases.....	3.69	5.03	3.59	5.21	4.38	3.18
No. of Os.....	13	33	56	23	39	62
Negative cases.....	4.57	5.77	5.91	6.45	5.04	4.00
No. of Os.....	54	35	11	45	28	6
Control.....	5.28	6.96	5.70	6.99	5.28	4.41
No. of Os.....	71	70	71	70	71	70
	QAP	CEF	GIW	POQ	LAJ	XEH
Test						
Positive cases.....	5.41	5.95	7.42	6.27	4.67	5.92
No. of Os.....	24	20	14	55	9	53
Negative cases.....	8.10	7.52	7.48	6.75	5.33	6.11
No. of Os.....	46	51	56	16	62	17
Control.....	8.76	8.18	7.89	7.37	6.01	6.66
No. of Os.....	68	67	68	67	67	68

any figure serving as test-figure requires fewer number of trials to master than as a control-figure. That is, an observer who has had past experience of a part of a complex figure takes fewer trials to complete the reproduction of that figure than another observer who has had no experience of any of its parts.

Secondly, a test-figure whose masked-figure is detected requires fewer number of trials to learn than one in which an observer fails to notice the masked-figure.

Thirdly, it is interesting to note that in eleven out of the twelve instances the average number of trials required to

learn the control-figure is larger than that to learn a test-figure whose included small figure has failed to be found. The two situations are similar in the respect that no past experience has been directly utilized, one having no past experience to make use of and the other failing to call upon it in a novel circumstance. It would seem probable that the difference is due to practice effect.

Practice effect is manifest in the learning of these nonsense figures. Its presence is shown by comparing the average of the number of trials a figure requires when it occurs early in the series of twelve with the average when it comes later in the series. This comparison is made possible by the shifts in the positions of the individual figures in the different experiments. Such averages are shown for control-figures in Table VII.

TABLE VII

AVERAGE NUMBER OF TRIALS FOR CONTROL-FIGURES IN DIFFERENT POSITIONS

Positions	ZIF	XUR	QOW	ZUB	GID	KOJ	QAP	CEF	GIW	POQ	LAJ	XEH
1 Av.....	5.62			7.26			9.00				6.89	
Os.....	52			19			30				37	
2 Av.....		7.12						8.18	9.81			
Os.....		50						67	21			
3 Av.....			5.80	8.10	6.05		9.05		7.04			
Os.....			31	20	19		21		47			
4 Av.....		6.55	5.68	6.13	5.24					7.04		
Os.....		20	19	31	21					47		
5 Av.....	4.37				4.84		8.00			8.15	4.93	7.70
Os.....	19				31		17			20	30	21
6 Av.....			5.57			4.41						6.21
Os.....			21			70						47

If we compare the trials required when a given figure is used as an early control with trials required when the same figure is used as a later control, we find in general a less number of trials with the later position. Now according to the general procedure, it will be remembered, the first three of the twelve complex figures are control-figures, then test- and control-figures alternately, and lastly three test-figures. Any

figure therefore occurs later in the whole series when used as test-figure than when used as control-figure of the same number. Other things equal, the effect of practice would thus be to give more rapid learning for test-figures.

Lastly, the relation between the complexity of the figures as measured by the number of trials required to learn when used as controls and the difficulty of finding their included simple-figures is found to be slight, the coefficient of correlation between the data of Tables VI and III, obtained by the rank-difference method, being .39 with a P.E. of .17, which shows extreme unreliability.

The Readiness with Which the Simple-figures are Isolated.—

It is time at this point to bring up for consideration the factor of readiness in segregation, in the sense of isolating the simple-figures at the first trial or during subsequent trials. Due to the fact that the task set for the observers was that of trying to commit the visual structure to memory, they were most intent at picking out any unit or units which could be readily grasped. Many of the observers followed a definite order of attack; *i. e.*, some made it a rule to start with the entire contour, others with the top or the left side, with the result that the accuracy of reproduction was emphasized at the expense of readiness in appropriate segregating. In order to discover how the different figures compare in this respect, the average number of trial at which the masked figure is unmasked is found and tabulated in Table VIII.

Aside from the averages, the Table gives also the number of 'successes' at first trial (Item 2), the percentage of observers making first-trial successes (Item 3), and success at first trial in percentage of total successes (Item 4).

The number of 'successes' in the first trial of the control-figures is only 3, so small a number that it has been omitted from the Table. As to that for the test-figures, it is shown in the second item of the Table, and the total of such successes is 231.

As should be expected, there is a direct relationship between the first and last items: the fewer the average number of trial at which the part-figure is isolated, the larger the

TABLE VIII
COMPARATIVE READINESS WITH WHICH MASKED FIGURES ARE APPREHENDED

		ZIF	XUR	QOW	ZUB	GID	KOJ
1. Av. no. of trial at which the masked fig. is isolated	Test....	1.92	2.12	1.53	2.43	1.44	1.16
	Contr....	4	—	4	—	—	1.6
2. No. of succ. at 1st trial	Test....	6	13	39	8	28	55
	Total no. of Os.....	67	68	67	68	67	68
3. Percentage of Os.....		9	19	58	12	42	81
4. Success at 1st trial in percentage of total successes	Test....	46.1	39.4	69.6	34.8	71.8	88.7
	Contr....	—	—	—	—	—	40.0
		QAP	CEF	GIW	POQ	LAJ	XEH
1. Av. no. of trial at which the masked fig. is isolated	Test....	2.33	3.45	3.43	2.13	2.33	2.32
	Contr....	—	—	—	4.62	6	3
2. No. of succ. at 1st trial	Test....	10	4	3	33	5	27
	Total no. of Os.....	70	71	70	71	71	70
3. Percentage of Os.....		14	6	4	46	7	39
4. Success at 1st trial in percentage of total successes	Test....	41.7	19.0	21.4	60.0	55.5	50.9
	Contr....	—	—	—	12.5	—	—

percentage of cases of successful isolation at the first trial. Little can be accomplished by comparing the figures when they are used as controls, since there are so few successful cases; however, one point is worthy of note. In every control-figure where a 'success' is recorded, it occurs at a later trial than that in the test-figures.

If we compare the order based upon 'success' at first trial in percentage of total successes (Item 4) and the average number of trial at which the masked-figure is isolated (Item 1) in this Table with that in Table III, we find a correlation of .65 with a P.E. of .12. Thus there is a positive relationship between the readiness with which masked figures are apprehended and the percentage of successes ultimately achieved. Comparing this Table with Table VI, we see a closer relation-

ship, the coefficient being $.77 \pm .08$ between the order of readiness in percent of first-trial successes (Item 4) and the order of complexity as measured by trials to learn the control-figures, and $.84 \pm .06$ between the latter and the order of readiness in terms of average number of trial at which the part-figure is isolated.

The correlation between the percentage of observers seeing the masked-figure in the first trial (Item 3) and that in any trial (Table III) is found to be $.94 \pm .02$. Between the former and the complexity of the figures as measured by the number of trials required to learn when used as controls (Table VI), the correlation is $.53 \pm .14$.

The Influence of Shift and of Partial Success.—It may be questioned whether the 'successes' as we have obtained them are not the consequence of a constant shifting of organization on the part of the observers in their attempt to master the figures. And may they not also possibly be results arrived at by way of partial successes?

To answer the first question, we proceeded to look for 'shifts' in both test- and control-figures and then to find their relationship to the number of 'successes.' By 'shift of organization' we mean the utilization by the observer of one type of organization in one trial and an entirely different type of organization in the following trial or trials. It is not considered a shift if the observer in the first trial succeeds in reproducing half of the test- or control-figure describing it as consisting of three units, for instance, and then in the second trial completes the figure by adding on the remaining parts but retains the organization of the units secured in the preceding trial. It is definitely a shift, however, if in the second trial those units are not reproduced at all or one or two of them combine with some newer parts of the figure to become a larger whole. There are numerous ways where shifts are observed, but in all cases a shift is recorded when the organization in one trial gives way to another in a succeeding trial.

An attempt is therefore made to find the relationship between the number of shifts in the figures as controls and the number of 'successes' in these as test-figures. To avoid the

complications arising from the possibility of a smaller likelihood of shift due to success in finding the simple-figure, shifts in test-figures are not included in the consideration. If shifting is beneficial to success, then a figure conducive to shifting by controls ought to be more likely to be 'successful.' The respective numbers in question are given in Table IX.

TABLE IX

RELATIONSHIP BETWEEN THE NUMBER OF SHIFTS AND THE NUMBER OF 'SUCCESSSES'

Figures	As Control-figures No. of 'Shifts'	As Test-figures No. of 'Successes'
ZIF.....	29	19
XUR.....	30	49
QOW.....	37	84
ZUB.....	26	34
GID.....	34	58
KOJ.....	25	91
QAP.....	49	34
CEF.....	43	28
GIW.....	37	20
POQ.....	32	77
LAJ.....	26	13
XEH.....	32	76

A computation, by the rank-difference method, of the degree of correlation between the number of 'shifts' and the number of 'successes' reveals complete lack of correlation, the result being $-.03$. Therefore success in discovering the simple-figures is not dependent upon the amount of shifting.

Whether shifting has anything to do with the amount of 'success' can be studied yet from another angle. Perhaps a relationship exists when the methods and achievements of individual observers are taken into consideration. If the observers making zero shift in the control-figures achieve less success in the test-figures as compared to those making an all-shift record, there might be some indication of a positive relation between the two functions with which we have been dealing. Accordingly, the observers are arranged into seven groups on the basis of the number of shifts from 0 up to 6 in the 6 control-figures, and the number of their respective successes in the test-figures is noted. These are shown in Table X.

TABLE X

AVERAGE NUMBER OF 'SUCCESSSES' MADE BY OBSERVERS GROUPED ACCORDING TO
THE NUMBER OF SHIFTS

Number of Shifts in Control-figures	Number of Observers	Aver. No. of Successes in Test-figures
0.....	17	2.88
1.....	24	3.08
2.....	24	2.60
3.....	19	3.10
4.....	21	3.00
5.....	11	2.45
6.....	22	2.82

There again appears to be no relation between the amount of shifting and the degree of success. Thus, a study of the relationship from the point of view of both the individual figures and the individual observers gives us negative results; 'shifting' cannot be held responsible for 'successes.'

After an observer made a 'successful' organization of a test-figure, isolating the simple-figure by means of the yellow mark, he usually retained its isolation during the following trials till the complex-figure was learned. There were only five cases out of the 401 'successes' of the test-figures in which the observer lost the simple-figure organization after he had once found it, besides two other cases of temporary shift and recovery of such organization. Of all the seven, however, only one mentioned in the introspections the similarity of this to the simple-figure learned before. It is likely that they did not come to a realization of the identity.

Can 'successes' be explained by the possibility of a tendency for the observers to catch on to a simple-figure from noticing a part of it in the process of learning to reproduce the complex-figure? That is, will seeing a partial simple-figure lead the observer to the getting of the whole of it? As described in a previous section, the simple-figures are likely to be learned as two parts, if not as one whole. It may be that getting one part of it in the test-figure will make the observer aware of the whole of the simple-figure and therefore lead to success.

Table XI gives the number of approximations or partials made in any trial as the first of the numerical figures in each

TABLE XI

NUMBERS OF APPROXIMATIONS OF THE MASKED-FIGURES AND NUMBERS OF 'FAILURES'

	ZIF	XUR	QOW	ZUB	GID	KOJ	Total
Test.....	33 54	19 35	4 11	18 45	16 28	1 6	91-179
Control.....	36 70	14 70	12 66	15 70	20 71	21 65	118-412
	QAP	CEF	GIW	POQ	LAJ	XEH	
Test.....	12 46	10 51	1 56	2 16	14 62	1 17	40-248
Control.....	7 68	5 67	6 68	8 59	10 66	4 67	40-395

column; the second number is the total number of cases showing no 'success,' and obtained by subtracting the number of 'successes' from the total number of observers tested on that figure.

In the test series we find a total of 131 partial 'successes' out of 828 cases in all the 12 test-figures. The total number of actual 'successes' amounts to 401 as gotten from adding the figures in Table III. Thus actual and partial successes put together come up to 532. If successes are due to jumping from a part to the whole simple-figure, then the total number of successes plus partials in the test and control situations ought to be comparable with each other, the control total consisting of mostly partials and the test total consisting of mostly wholes and few or no partials. As a matter of fact, the total for the control situation is only 179, with 21 cases of isolation of the whole simple-figure and 158 partials.

Moreover, if we omit the 'successes' and consider only the remaining cases as possible exhibits of partial successes, we have 131 partials out of 427 chances, or 30.5 percent, in the test series; and in the control series, 158 partials out of 807 chances, or 19.5 percent. Not only are the complete 'successes' mostly confined to the test series; but, relatively, there are, in the test series, more partial successes that do not lead on to complete successes. It seems impossible to explain the successes of the test-series as merely completions of the partial successes that would be there anyway.

It should be added that no partial 'success' was ever recognized and reported in the introspections as pertaining to the original simple-figures.

Since the total number of complete 'successes' in the test-figures was 401, and 231 of these were found on the first trial, there remained 170 cases of success at trials later than the first. In 37 of these 170 cases, the complete success was preceded by a partial success; in 32 of these the partial success was shown for one trial only immediately preceding the complete success. The average trial at which these partial successes occurred was 2.4. The average trial at which the 131 partial successes not followed by complete successes (131 out of a possible 427) occurred in the test series was 2.8. There is no apparent reason to suppose the complete successes arose primarily from the partial successes even in these 37 cases. The average trial at which partial successes occurred in the control series was 3.1.

Results of Second Series of Test- and Control-figures Following the First.—The twelve simple-figures were masked under different complex figures with entirely different non-sense-syllable names. These were presented without any additional instructions at the end of the main experiment to sixty-four of the observers who could afford to give the extra time. The results are not given in detail, but a few general facts should be noted.

The test cases showed 64 percent 'successes,' the control cases 6 percent. If we designate the complex-figures by the enclosed simple-figures and arrange them according to the percentage of success in the test cases, we find a correlation of $.81 \pm .07$ between the figures in the main experiment and in this supplementary experiment. But without controls, we cannot determine clearly whether this is due to intrinsic characters of the simple-figures, or whether isolation of a given figure in one complex setting increases the probability that that same figure will be isolated in another complex setting, a direct influence of experience of the figure in a setting. That the latter is the true explanation is indicated by the fact that for any given observer the specific figures isolated in the main experiment, counting all three presentations, were usually isolated in the supplementary experiment, and in addition a few other successes occurred. It may be

observed that, counting the second and third presentation, these 64 observers showed 56 percent successes in the main experiment and added only 8 percent to give the 64 percent success in the supplementary experiment. Of the 23 cases in which a simple-figure was segregated in the controls, 9 were the specific figures isolated by the same individual observers in the main experiment and here picked out and recognized as having been experienced before; and 7 additional were all of one specific figure which was poorly embedded.

It would be of interest as a control to use the figures of the supplementary experiment with a new group of observers.

DISCUSSION AND SUMMARY OF RESULTS

The results of this experiment point to the conclusion that past experience does make a difference in the way a complex visual pattern is organized. A great number of possibilities of dividing into recognizable units existed in the complex figures, which indeed were organized and learned in a great variety of ways. It was exactly because of this capacity for variation that a small percentage of the cases with no previous experience so organized the control-figures that the masked-figures were separated. However, the advantage of past experience enabled a great proportion of the test groups not only to recognize and utilize the learned part in the building up of the larger whole, but also to learn the complex figures with greater ease.

The habit of learning the complex figures in terms of individual lines rather than separate or overlapping units possessing definite form prevented not a few of the observers from finding the concealed simple-figure, which in the course of being committed to memory, had been conceived of as a unitary form.

When a part of the body of a simple-figure was seen deeply absorbed and imbedded in a neighboring unit, this masked-figure easily lost its identity. Often the units in question were described as geometrical patterns or objects of daily encounter, showing the strong tendency for the observers to attach meaning to the units. The supposedly nonsense

figures became meaningful in the process of learning. The manner of organization so discussed may be the coöperative result of past experience, recent and remote, and possibly native tendencies. The obstacle to a clearer understanding is that what is native cannot very well be wholly separated from what is acquired, particularly in adult observers. There are doubtless certain principles of organization that one should call native, whatever that may ultimately mean. Such are persistence of unbroken line, inclusion and exclusion (unity of contours enclosing or excluding unbroken space), belonging together of lines with any sort of homogeneity of direction, etc. Gottschaldt's figures would seem to be largely determined by such factors so that experience could have little effect.

However, our experiment is concerned chiefly with the rôle of past experience where many organizations are more or less equally possible. Whether and how native factors condition ways of organization must be further determined by experiments better suited for the purpose than the existing ones.

Our problem has been to investigate experimentally the rôle past experience of visual forms plays in the organization of more complex visual forms in which the former were included in concealment. A summary of the results is as follows.

1. The masked-figures were seen as separate units in their respective complexes twenty times more often by the experimental groups than by the control groups and seventy-seven times more often on the first trial. This great difference existed as an outcome of the former's having learned those figures in isolation. Therefore past experience plays an important rôle in our visual organization.

2. For the observers who had had past experience, some masked-figures were more easily found than others. Past experience varied in the amount of its effectiveness.

3. A search-attitude was not a decisive, but possibly a contributing factor in the discovery of masked-figures.

4. The readiness with which a masked-figure was isolated bore a relation to the total probability with which the masked-

figure was found and to the complexity of the figure containing it as measured by the number of trials required to learn.

5. Success in discovering the masked-figure during learning was not dependent upon shifting and partial success.

6. Discovery of a simple-figure in one complex setting seemed to make more probable the discovery of the same figure in another setting.

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